

Interaction of stabilizing and destabilizing factors and bifurcations of phase transition fronts

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We study the competition between the Rayleigh—Taylor instability and stabilization by the vertical flow through the boundary of phase transition in geothermal systems in dependence on the thickness of the low-permeability layer and permeability for fixed pressure drop and homogeneous conditions at the instant borders of the low-permeability layer. This competition becomes apparent by non-uniqueness of localization of plane phase transition fronts, at least one of which being always unstable. The multiple fronts appear as a result of bifurcation from the unique stable front. In a neighborhood of the bifurcation point dynamics of a narrow band of weakly unstable and weakly nonlinear modes is described by one form of the nonlinear Kolmogorov—Petrovsky—Piscounov equation (KPP).

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